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ABSTRACT

The project at Beaufort County Technical Institute has culminated in the development of an instructional system that provides each student desiring to enter the Electrical Technology curriculum the opportunity to enroll at any time during the year and to work at a pace determined by his own ability, background and motivation. The systems approach was designed to develop multisensory approaches to the learning process, thus providing for students with a wide range of academic backgrounds the opportunity to satisfy their learning styles in more than one way. Discussed in detail are five core objectives of the project: (1) multientrance dates, (2) measurable objectives structure, (3) student pacing, (4) positive reinforcement, and (5) individual attention and instruction. The function of the instructor is based on his flexibility and his ability to provide personal teachings and make evaluative judgements where needed, rather than to be merely the medium of instruction. Students with low academic motivation scores are performing and achieving satisfactorily in the newly designed curriculum, thus providing negative correlation for the test instrument used. (SA)

PROJECT OPERATION

All instruction in this course is conducted on a laboratory basis and although utilizing the latest technology and multi-media, it is far more personalized than any traditional classroom situation.

As completed, the Electrical Technology curriculum at Beaufort Tech is totally systematized, incorporating individualized approaches leading to the mastery of 80 "mini-courses" involving 200 measurable objectives. Throughout the design the AV-tutorial method is the major mode for learning, and in this area over 100 audio tapes and 1800 slides (35 mm) are utilized to effect skills mastery.

Admission to this program is listed under the general requirements for entrance in the Beaufort Tech catalog.

Briefly, applicants must be eighteen years of age, and possess a high school diploma or an acceptable equivalency certificate. Further, a high school transcript must accompany all completed application forms, and all applicants are subject to entrance policies requiring personal interviews and admission inventories.

H.S. Bowers, Chairman
Electrical Technology Dept.

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TECHNOLOGY

ORU

Department of Community Colleges

PROJECT HISTORY

In July, 1971, Beaufort County Technical Institute became the recipient of a two-year grant from the Occupational Research Unit of the Department of Community Colleges. This grant was for the design and implementation of an innovative instructional system in Electrical Technology.

The ORU Project called for emphasis to be placed on self tutorial and individual instruction. It was successfully designed on this premise and has been easily adapted to the range of intellectual, emotional, environmental and physical differences of our student population.

Quality education has always been given high priority at Beaufort Tech, and we are pleased that this project has prospects of contributing to our high standard.

On behalf of the trustees, students, administration and faculty of Beaufort Tech, I wish to thank the Department of Community Colleges for their assistance in furthering our educational philosophy.

James P. Blanton
President, B.C.T.I.

PROJECT [illegible]

From a learning standpoint the structure of the ORU Project was designed to insure that five identified goals affecting student behavior were accomplished. The "systems approach" designed for this project, therefore, specifically provided many ways for the student to satisfy his own learning style, and granted the instructor the means to reach the various cognitive styles of his students. In brief, the following represents the core design of the ORU Project.

1. Multi-Entrance Dates

Electrical Technology I students are permitted to enter the course at any time, not just the traditional entrance dates at the beginning of each term or quarter.

2. Behavioral Objectives Structure

The entire course is designed with measurable objectives that have terminal points at each level of competence. Included in this format is a system of pre-entry evaluation which allows students to begin work precisely at the level where they need instruction. Consequently, students need not repeat work for skills previously acquired.

3. Self-Paced Study

All students in Electrical Technoiogy are allowed to progress academically at their own speed. They are evaluated strictly upon acquiring identified skills, and no one is ever penalized for however much time he needs to successfully master the course requirements.

4. Positive Reinforcement

ORU-Electrical Technology is so constructed that a student never fails a test of record. By design, the written and performance tests are given primarily as counseling instruments. If a student does not successfully measure up to a required skills level on the first attempt, sufficient repetition for a weakness is provided

allowing each student the opportunity for eventual success.

5. Individual Attention and Instruction

Each individual enrolled in Electrical Technology has the guarantee of receiving individual and personal help at all times. Each check point, or test, is evaluated immediately upon completion in either a one-to-one conference or with a very small group. In this fashion, many of the social and academic handicaps often affecting students may be compensated for personally.

OCCUPATIONAL EDUCATION RESEARCH PROJECT FINAL REPORT

Vocational Education Amendments of 1968 (Public Law 90-576)

(Title I - Part C - Sec. 131 [b])

RESTRUCTURED REGISTRATION AND INSTRUCTIONAL OPTIONS

Danny J. Simmons

Project Director

BEAUFORT COUNTY TECHNICAL INSTITUTE

WASHINGTON, NORTH CAROLINA 27889

June 30, 1973

NORTH CAROLINA DEPARTMENT OF PUBLIC EDUCATION

OCCUPATIONAL RESEARCH UNIT

RALEIGH, NORTH CAROLINA 27611

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A very special thanks to my wife, Linda, for taking hours of dictation and proving a very competent editor.

Most of all, thanks to Mr. Fred Manley, Assistant Director of the ORU, for all his advice and assistance in expediting implementation of this project.

ABSTRACT

The award of an Occupational Research Unit project grant to Beaufort County Technical Institute has culminated in the development of an instructional system that provides each student desiring to enter the Electrical Technology curriculum at Beaufort Tech the opportunity to enroll at any time during the year and, further, allows such students to work at a pace determined by the student's ability, background, and motivation.

In essence, it is a "systems approach" to a technical curriculum that has refined an administrative and educational process, allowing a student to enter Electrical Technology at Beaufort Tech whenever he is ready; accounted for a wide range of academic backgrounds by developing multi-sensory approaches to the learning process; and, provided a vehicle for the motivation of students lacking positive self-image and confidence to receive motivation in their pursuit of learning by allowing them the right to learn at their own speed.

Since the inception of this new program, it has been satistically established that students entering Electrical Technology who received low motivation scores on the College Guidance and Placement instrument used at Beaufort Tech (Section II.B. in this report) are proving a *negative correlation* for this test instrument figure. In other words, those students with low academic motivation scores, and thereby possible low success predictability, are performing and achieving satisfactorily in the newly designed Electrical Technology curriculum.

From a composition standpoint, the objectives of this ORU project were fashioned to ensure that five identified areas regarding student behavior were accomplished; and, in order to facilitate understanding for what will come in the body of this report, a sketch of the background briefly outlining these five areas of emphasis is in order.

As the developers saw it, the primary goal of any instructor involved in this ORU project was to diagnose successfully the various learning styles of his students. In other words, try to determine what the student's strengths and weaknesses were and then manage the student's learning environment utilizing as many approaches as necessary to capitalize on the identified strengths. The systems approach designed for this particular project, therefore, provided for the student more than one way to satisfy his own learning style. For example: for those with a poor reading background, compensation was made by presenting instruction through audio or video means, or a combination of the two. For those students who were comfortable with reading material, and had the ability to comprehend, sufficient amounts of printed material were integrated into the system allowing them to pursue the printed word as rapidly as they wished. With this philosophy in mind, the following list will introduce the core design of the ORU project in brief form. As this report progresses, each area will be covered in detail.

PROJECT OBJECTIVES

1. *Multi-entrance dates;*
2. *Measurable objectives structure;*
3. *Student paced;*
4. *Positive reinforcement; and*
5. *Individual attention and instruction.*

To be candid, it is not the suggestion of the developers of this project that this method will solve all current problems such as facility overload, shrinking budgets, and enrollment fluctuations encountered by educators throughout our system and similar ones.

The educational vehicle described herein, however, has proved effective in training students with low motivation quotients, and has contributed

to a two hundred percent increased enrollment in Electrical Technology at Beaufort Tech during the past two years. Appendix V of this report illustrates an interesting study performed by the Department of Student Affairs at Beaufort Tech, reflecting the significance of this enrollment increase in terms of FTE's generated.

The approaches defined in the following pages have proved viable, and should provide the impetus for other institutions to implement similar programs.

I INTRODUCTION

I.A. PROJECT BACKGROUND

In July 1971, Beaufort County Technical Institute became the recipient of an Occupational Research Unit (ORU) grant from the North Carolina State Board of Education for the design and implementation of an innovative instructional system. Basically, the philosophy of the project was to create a learning program which would eliminate the less desirable aspects of traditional teaching methods and emphasize the advantages of self-tutorial and individualized instruction. This project, described herein, had a two-years duration during which the first year was spent in the creation and design of the project and the second year in implementation and revision work for the overall design. At conclusion, this ORU project met all proposal specifications and has easily adapted to the range of intellectual, emotional, environmental, and physical differences among our student population.

I.B. SYNOPSIS OF APPROACH FOR THE DEVELOPMENT OF THIS PROJECT

The *first requirement* for development was the breaking down of the overall courses or program into sets of behavioral objectives that could be assigned as learning tasks to individual students. This procedure established tasks or goals which the student could actually accomplish. The objectives were not stated in vague or general terms such as "reading" or "learning" material, but set forth explicitly what the student was expected to do as a result of having read or learned assigned material. These objectives were then numbered and developed into learning units. An earnest attempt was made to avoid the trivial or insignificant, and at the same time, avoid the impossible.

The *second step or requirement* of this system was the development of the learning units which prescribed various learning activities through which the student could accomplish the assigned objectives. These learning units referred the student to specific instructional materials which enabled him

to accomplish the particular objectives that had been assigned. During this phase, it was recognized that there were many ways and many instructional materials (both locally produced and commercially produced) involving many different types of learning activities, which would lead to the accomplishment of the same objective. It also clearly reinforced that individuals do differ with respect to their learning styles. Therefore, the system had to allow for those students who may have preferred to learn through auditory means as opposed to reading, or visual as opposed to either.

The *third requirement* of this systems development was the design of a program for the assessment of the performance of students relative to the educational objectives. The items or tasks in all tests were based on the objectives themselves and not on what the student studied as a means to achieving the particular objectives. Thus, the tests measure not what the student has learned or studied, but what he is able to do as a result of what he has learned or studied.

The *fourth requirement* was the development of an administrative structure which would permit a student to enter at any interval between regular quarterly registration periods and guidelines to properly regulate this new instructional/administrative concept.

I.C. SEQUENCE OF DEVELOPMENT

July I, 1971 - Project Award

As soon as notification of project approval was received, the educational specialist who would be the principal researcher and developer, Mr. D.J. Simmons, was employed and began development on July 15, 1971.

Phase I - July I, 1971 to September 30, 1971

Attention was focused on building a knowledge base for program development. Basically, this was a study/researching period geared to generate

approaches to program development.

Phase II - Program Development and Projection (October 1971 to May 1971)

During this period, a rough program was evolved that could be field tested, evaluated, and refined during the summer, fall and winter quarters (1972-1973).

Phase III - Experimentation and Refinement (June 1972 to December 1972)

During this period, emphasis was on field testing, orienting personnel, planning continuous professional growth opportunities, and assessing/refining the program and its progress. One assistant instructor was employed due to enrollment growth.

Phase IV - Diffusion and Integration (January 1973 to June 1973)

Here, final effort was made to modify and integrate the "open enrollment" and "teaching by objective" concept into the ongoing education of the electrical technology students. Particular emphasis was given to dissemination and demonstration activities, and to finalizing those techniques successfully applied in the project's planned educational change.

II. BODY

II.A. PROBLEM STATEMENT AND PROJECT RATIONALE

The major problem encountered in the education process of the rural disadvantaged students enrolled in vocational/technical programs at Beaufort County Technical Institute (and other institutions with the same geophysical makeup) is the reinforcement of subject matter and the motivation of students by attitudinal adjustment toward education per se. For the most part, the communities these students represent are insulated from national cross cultural exchange and their problems, needs, strengths, and goals remained umbilically tied to the parameters of their environment. The latest figures from United States government agencies, for example, reveal that within our contiguous four county services area, the average school years completed is 8 years for the overall population, and 6.2 years for minority races. By comparison, this area falls below the national average which is 10.6 years for all groups and 8.2 years for minority races.[1]

Most of our students are ill prepared to meet the challenge of college work since they come from small rural high schools which are not adequately prepared to serve these students, and in many instances, they have been educated only marginally. As a result, many of our technical/vocational students are deficient in the basic academic areas of reading, English and mathematics. Test scores (Comparative Guidance and Placement Program) reveal that our average student scores form 10 to 19 percentage points lower than the national norm. (See: Table I, Section II.B)

[1]*Mid-East Center Commision, "Positive Action Plan for the Washington Growth Center," Washington, North Carolina, March 1972*

Since our students are behind in every test category, it is evident that a great deal of effort needed to be spent on programs reshaping their educational opportunities in order to prepare them for coping within a highly technological society.

From these sources and more, it is apparent that a real and significant educational problem does exist in our area. In response, Beaufort County Technical Institute brought an attitude of concern based on the conviction that improvements can and must be made in local education in order to eliminate the following student deficiencies typical of this area.

1. Poorly conceived notions of career choices.
2. Poor early training in basic skills denying opportunities to hold a satisfying, rewarding job.
3. Unimpressive and sketchy goals development.
4. Indications of multiple social service needs.
5. Questionable attitudes toward the value of education and training.
6. Poor identification and evaluation of self-interests and abilities.
7. Poor personal habits limiting employability after training.
8. A non-real conception of education processes and the working world (perhaps serious over/under estimation of either abilities or handicaps).

It was, therefore, the purpose of this project to devise and suggest a way to overcome these prevalent conditions and to design systems and programs particularly suited for the needs of these identified individuals.

II. B. PROJECT STUDENT POPULATION CHARACTERISTICS

Since this is an ongoing program incorporating multi-entrance opportunities, the enrollment in Electrical Technology since the beginning of the pilot phase in September, 1972, has ranged from a beginning 26 to a high of 40. Naturally, on a multi-entrance basis this figure stands to change at any given

time. Consequently, the data reflected in this report will not, in all cases, reveal terminal statistics. The data will, however, reveal valid statistics as it relates to the progress of individuals through June 30, 1973 (project termination date).

Therefore, all statistics relative to the students themselves and their academic achievement will reflect cumulative enrollment where germane and specific enrollment (the 26 that started the program simultaneously in September, 1972) for individual comparative study.

I. *GENERAL DATA*

As of this report, there were 34 students enrolled in Electrical Technology. General data for this group is as follows:

a. Sex - All male.

b. Racial Mix - 24 white and 10 black.

c. County of Service - Beaufort-23; Washington-7; Hyde-1; Other-3.

d. Veterans - 14.

e. Age - 18-49; average - 28.5 years.

2. *ACADEMIC DATA*

All students entering Beaufort County Technical Institute for the first time are inventoried via the Comparative Guidance and Placement Program instrument which provides general information services for students, faculty and administrators at the two year post secondary education level. Reports from this instrument are produced for students and their advisors which consolidate information about surveyed students for empirical and evaluation purposes.

The CGP examination covers a broad range of educational indices, and since all electrical technology students are included in this survey, a brief description of the instrument and specific examples of electrical technology student performance would be in order.

Selected Components

a. CGP Reading: Designed to measure ability in three areas. Comprehension of the main idea; comprehension of specific details; and ability to make inferences from explicit statements.

b. CGP Math: The scope ranges from solution of simple arithmetic problems to problems requiring a minimum of two years training in algebra.

c. CGP Sentences: This area measures a student's mastery of standard written English. It includes problems in grammar, usage and punctuation.

d. CGP Year 2000: This test involves the student's ability to remember a set of printed directions. The directions become increasingly complex as a student proceeds through the test. Naturally, this particular section of the CGP instrument was of great interest to the ORU project developers. Research in our institution correlated with other similar institutions indicates that the Year 2000 test has a high positive correlation with the success in technical programs.

Although this is not a total breakdown of the components of the CGP instrument, it will provide some background for the comparative performance data to follow. It should be of great interest that, as stated in the Abstract, there is a negative correlation for the Academic Motivation CGP scores for the electrical students as compared with their course performance. It is quite clear that in spite of lower than average motivation scores (in some cases extremely low) the electrical students are performing at or above the achievement goals established by the project. (This seems to be the largest single instance of negative correlation involving the CGP instrument and other curricula at Beaufort Tech.)

Quite naturally, since increasing student motivation was a primary component of the ORU project design, the developing staff is delighted with the obvious success in this area. (See Table 1)

II.C. SUMMARY OF INSTRUCTIONAL SYSTEM

1. *PROJECT OBJECTIVES*

The objectives of this project, as stated in the abstract of this report, were to design, develop and implement an educational system composed of five learner oriented components. The five components of the resulting system are as follows:

a. *Multi-entrance dates*

The traditional entrance dates for most courses at Beaufort Tech are at the beginning of each academic quarter. The design of the ORU Project changed this by incorporating a feature through which a student could enroll in the Electrical Technology curriculum at any time. As a matter of practice, students may enroll in Electrical Technology I any time of the day, during any day of the week, thoughout the academic year at Beaufort Tech.

This modification has been accomplished through a new administrative enrollment procedure implemented by the Chairman of the Electrical Department and the Admissions Officer at Beaufort Tech. Conjunctively, at the time of this report, all related courses to Electrical Technology I can be offered on a multi-entrance, individualized basis with the exception of the related English courses. It is anticipated that this exception will be removed during the fall quarter, 1973.

b. *Measurable objectives structure*

The entire ORU/Electrical Technology Project was designed through

TABLE 1

SELECTED SAMPLE COMPARING CGP SCORES WITH COURSE ACHIEVEMENT

STUDENT	READING		SENTENCES		MATH		YEAR 2000		Academic Motivation		UNITS COMPLETED	AVERAGE TO DATE
	STD.	Nat'l Rank	STD.	Nat'l Rank	STD.	Nat'l Rank	STD.	Nat'l Rank	STD.	Nat'l Rank		
WB	54	59	46	34	n/a	n/a	57	70	35	07	26	96.6
HD	47	34	39	15	n/a	n/a	45	26	49	48	14	90.2
WF	54	59	51	50	49	48	51	47	49	48	14	90.3
SG	41	19	32	04	43	27	36	07	47	37	14	90.6
FJ	49	45	61	85	50	50	54	59	56	73	15	93.8
MK	33	04	39	15	41	21	20	01	49	48	7	92.7
GL	44	25	41	18	45	34	57	70	47	37	14	92.7
KL	33	04	37	10	33	02	33	04	52	57	7	92.0
PL	56	71	58	77	55	66	60	80	32	01	13	92.6
HP	36	08	39	15	40	17	24	01	54	65	19	91.4
HR	58	72	57	72	59	78	60	80	35	07	16	91.1
JS	47	34	43	22	44	29	39	17	43	23	14	90.5
WJ	44	25	34	06	36	07	54	59	n/a	n/a	21	95.0
WW	30	02	31	03	33	02	30	02	62	89	15	90.2
PJ	59	78	56	67	48	43	57	70	37	11	16	91.0

behavorial objectives with terminal points at each level of competence. In effect, students are allowed to begin work precisely at the level where they need instruction and they cannot proceed to higher units until they demonstrate mastery of the unit undertaken.

c. *Self Paced Learning*

Another result of this project was the allowing of students to progress academically at their own speed. Fast learners are, in some cases, finishing the course in half the time it takes for slower students. Since it is an educational fact that all learners have varying speeds, the ORU Project at Beaufort Tech adequately compensated for each one's particular pacing. With the traditional time frame thrown out, they no longer have only a specific number of weeks to master a specific number of skills in order to receive a grade at the end of a quarterly grading period. The students are evaluated strictly upon obtaining or acquiring identified skills and no one is ever penalized for time needed to successfully master course requirements. It must be noted, however, that some academic and emotional immaturity problems appeared among two of our students which resulted in the Electrical Technology Department taking steps to insure that their actual learning pace was not the same as the pace they chose to learn.

d. *Positive Reinforcement*

In order to reinforce to a student that he was allowed to progress academically at his own pace, the project was so structured that a student would never fail a test of record. By design, the written and performance tests were given not only as measurement devices but also as counseling instruments. If a student did not successfully measure up to a required

skills level on the first attempt, then that unsatisfactory score was recorded temporarily, and student was then guided to correct his errors. In this manner, if a student's performance was not up to an acceptable level, sufficient repetition for a weakness was provided allowing each student the opportunity to eventually succeed.

e. *Individual Attention and Instruction*

Each individual enrolled in Electrical Technology has the guarantee at the onset of receiving individual and personal help and attention at any time during this course. Each checkpoint or test is evaluated immediately upon completion in a one to one conference, or at the outside, very small groups with the instructor.

In essence then, the ORU Project was designed to allow the students to become the master of their own education plan. If any problem should prevent them from attending class for a day, a week, or however long, the next lesson or the same lesson was always available for that student when he returned.

2. *COURSE OBJECTIVES*

The course objectives for the ORU/Electrical Technology program at Beaufort Tech were originally derived by Mr. Harold Bowers, Chairman of the Electrical Technology Department, but revised in behavorial terms by the project director to remove verbal behaviors and make the objectives more revelant to the demonstrative skills required by occupational standards. The final set of objectives for the ORU/Electrical Tech project provides a broad coverage of electrical principles and skills required for those entering Electrical Technology fields. Table II (on the succeeding page) gives a breakdown of the objectives by course, and behavorial requirements, where the behavorial requirements are defined as follows:

TABLE 2

COURSE BREAKDOWN BY OBJECTIVES AND BEHAVIORAL CLASSIFICATION

COURSE	APPLICATION	COMPREHENSION
ELC 103	12	7
ELC 104	10	9
ELC 105	12	13
ELC 230	0	10

a. *Psychomotor (application)* - the student performs a basic skill in a simulated or actual on the job task situation.

b. *Cognitive (comprehension)* - where the student identifies or applies a basic principle in a situation not previously encountered by the learner.

3. *CURRICULUM*

The course objectives for the ORU/Electrical Tech project were clustered and sequenced within the curriculum on the basis of their contribution to the performance of actual job tasks. This curriculum organization was used to insure that students acquired the necessary skills and concepts in the context of performing a realistic task. The project staff believed that a job oriented curriculum was critical in establishing the relationship between the skills and concepts a student acquires in a course and the job for which he is being trained.

The clustering of objectives into lesson units within the curriculum structure was based on the complexity of the objective behavior and the relationship between objectives. If the behaviors leading to mastery of on objective required not more than 50 minutes of instruction, it was usually combined into a unit with other behaviors on the basis either of proximity in the curriculum or dependency in the conceptual structure. (i.e., symbol recognition behaviors were usually combined into a unit requiring application through identification to a particular circuit.) If the behavior leading to an objective required more than 2 hours of instruction, and if the enabling behaviors could be divided into subtasks having meaningful products, the content was distributed equally within the major unit. The final course curriculum was constructed by developing the unit lessons on a prerequisite basis within the normal course sequence.

A sample unit developed for the ORU/Elec Tech Project is provided in the Appendix of this report. A complete copy of all the instructional units developed is available through ORU channels.

4. *INSTRUCTIONAL MEDIA AND MATERIALS*

The decision to individualize the project curriculum (in the sense that the student should be able to learn at his own pace) restricted the selection of media to those that could be used by the student on an individual basis. The selected media included the following types/forms:

- Audio tapes
- Visual aids
- In-house produced course study supplements (four)
- Varying texts and outside technical resource documents
- Curriculum guidance documentation
- Post test examinations (written and mechanical)

These media and materials are described in more detail in the following pages of this report.

a. *Audio/Visual*

The majority of the AV material was presented in the 35 millimeter slide medium correlated with an audio tape cassette cued to slide advance by audible sounds. Both presentation techniques were provided by standard, familiar equipment--an auto-focusing carousel slide projector and a small cassette tape player/recorder. This equipment is not sophisticated and is operated easily and without difficulty by the student.

b. *Course study supplements*

These in-house produced texts contain all the data necessary for a student to "track" himself through the developed courses. These supplements are used individually by the students on a self-paced basis at student

carrels in the software lab or at work stations in the laboratory. The supplements themselves are carefully developed in sequential units and contain self-sustaining information, adjunctive resource information, listing and procedures for all audio visual study, and complete listings for needed equipment and relevant resource documentation.

By category, these course study supplements provide the following:

- Related key technical information
- All resource assignments
- Statements of objectives in behavioral terms
- Complete listings of all necessary tools, equipment, supplies, and materials
- Complete listings of all laboratory procedures, correlated to audio and visual reinforcement; and
- Needed schematics and diagrams not otherwise available or readily accessible.

Throughout the development of the project, the selection of media for specific lessons was based on two premises:

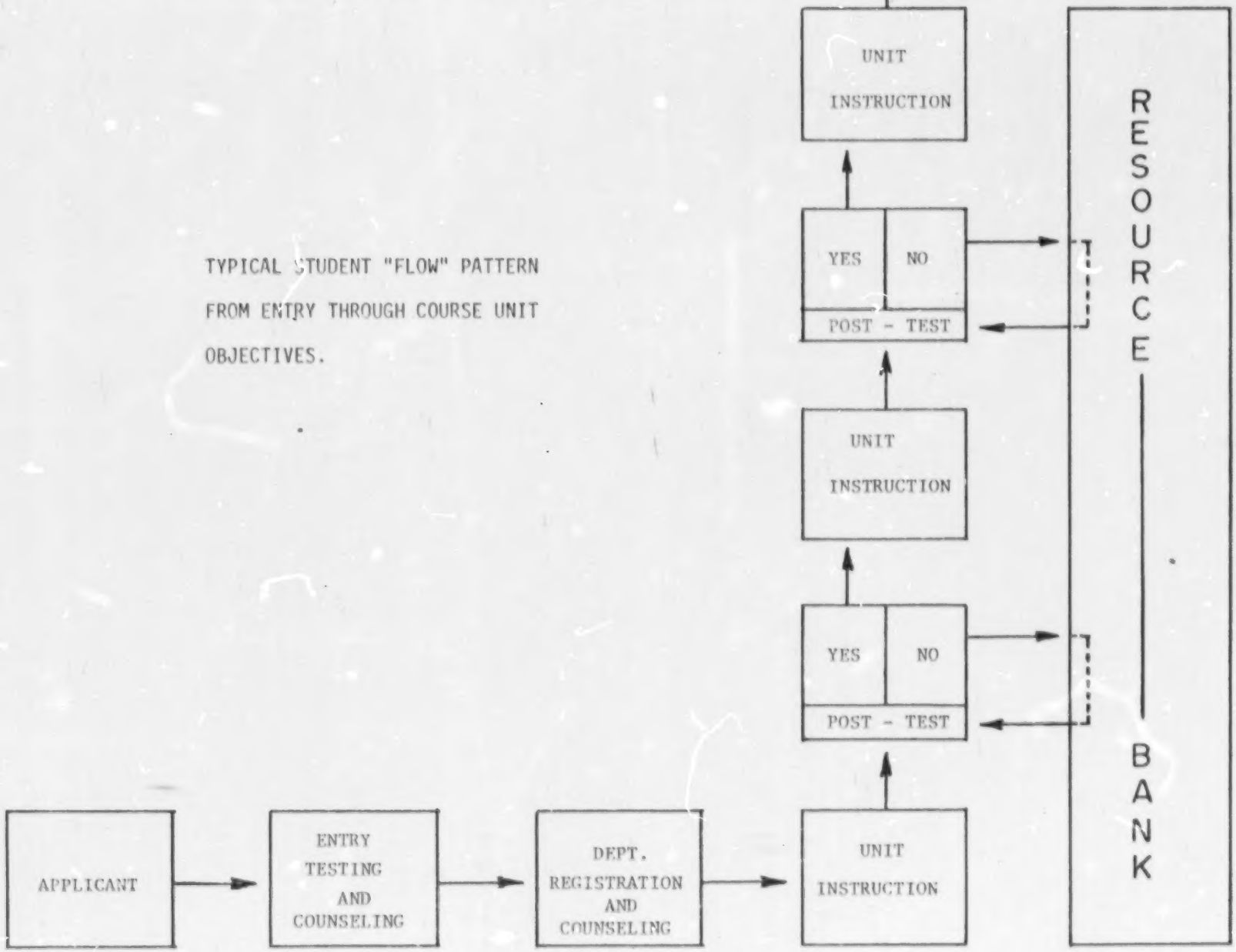
- The compatibility between the behavioral properties of the instruction and the capabilities and limitations of the involved media; and
- cost, of course, always an inherent consideration.

5. *INSTRUCTIONAL SYSTEM*

The flow chart on the succeeding page depicts the system by which the student spacing progresses through the units for each course.

After acceptance into the program, and a proper orientation session, if the student is not completely confident in his ability to perform the technical skills required by any unit, he proceeds directly to the unit

TYPICAL STUDENT "FLOW" PATTERN FROM ENTRY THROUGH COURSE UNIT OBJECTIVES.



instruction and follows the procedures for completion contained in that unit. If a student selects to take a pre-test for that unit, (perhaps as a result of prior experiences), a test will then be administered by one of the instructors. The test results will then be discussed during a conference between the student and an instructor and a decision will be made as to whether or not the student should by-pass the unit in question.

When a student is required to cover the unit instruction, he is directed by his study supplements as to procedures and requirements. Depending upon the technical content of the unit, the student will work independently at either a study carrel in the software lab or a work station in the laboratory. When the unit instruction is completed (including all lab assignments), the student will then have an instructor evaluate his work, and if acceptable, will take any required post tests. A conference between the instructor and students is then held to assess the progress of the student and to identify appropriate reinforcement activities if necessary. If the student's progress appears satisfactory, as validated by the instructor, the student will then proceed to the next unit in sequence. If there is any doubt as to the ability of the student to perform at a mastery level, he will be assigned a reinforcing remedial activity. Depending upon the nature and extent of the student's deficiency, the reinforcing remedial activity may range form on-the-spot instructor counseling to an assignment involving supplementary technical resources. This process continues until each student, regardless of the individual time required, reaches a satisfactory level of performance.

For purposes of illustration, some expression should be given to the sequence of daily operation.

At Beaufort Tech the entire Electrical Technology class has regularly scheduled working periods, but since the labs are open, the students may enter and begin work at any time they wish. Whenever they are in the lab, however, (because of the open lab policy) they are required to account for their presence by filling out a daily time record, and a lab log sheet if their study involves any laboratory exercises.

Normally, after checking into the learning room and determining where they left off, need to begin, and/or what supplies and materials are needed for the assignment, the students generally review the appropriate study supplement, check out the necessities for the day's performance, and proceed to work.

If audio-visual activities are required, the student (having learned the logistics during orientation sessions) will locate the needed software and return to his study station to begin absorbing the necessary data for the unit requirements.

It should be noted that as a result of the overwhelming reception of this self-tutorial based program, it was elected through demand (current students, incoming students, and local industry) to keep the labs open at night as well. As of this report, the individualized learning room is open from 8:00 a.m. to 5:00 p.m. Monday through Friday, and from 7:00 p.m. to 10:00 p.m. two nights a week, with anticipated expansion to four nights a week. In effect, the design and implementation of the ORU/Elec Tech program has partially eliminated some of the barriers to education

encountered by individuals who found themselves hampered through being employed in jobs involving rotating-shift working hours.

Another interesting facet of the instructional system derived through the ORU Project is the dovetailing of institutional training with Beaufort Tech's cooperative education components. Those students in Electrical Technology who complete sufficient course objectives have the option of spending alternating periods earning and learning on the job prior to Institute graduation. Through liaison with the Chairman of the Electrical Department, the coordinator of the Cooperative Education Program has placed Electrical Technology students in local industries such as Weyerhaeuser, Inc., and in out-of-state positions as far away as Pennsylvania.

Perhaps the most important element in the ORU/Elec Tech instructional system is the instructor. Unlike most courses of instruction, the instructor is not the general mode for presenting information; the various course media are quite effective communicators. Rather, the classroom function of the instructor is based on his flexibility and his ability to provide personal teaching where needed and make evaluative judgments.

Under this system, the instructor's functions are to:

a. Administer and evaluate individualized performance examinations, and,

b. Conduct counseling sessions with individual students for the purpose of identifying learning deficiencies and initiating remedial action (either directly or by assignment).

In addition, the instructor is to:

c. Provide feedback as to the efficiency of student performance during the lessons,

d. Answer student questions concerning either technical matters or the curriculum system,

e. Collect and record data useful for evaluative purposes, and, perhaps most important:

f. Maintain the inherent motivation of the students by creating a classroom climate that is both nonadversive and purposeful.

Whatever one's bias towards this particular mode of learning, it should be noted that an observer accustomed to the quiet discipline of a conventional instructor-presented course might be upset by the apparently chaotic conditions he may observe in the Beaufort Tech electrical laboratories. It is possible that an uninitiated observer could discover several students quietly reading (oblivious to random lab noises such as AV equipment being operated by others), students leaving or returning from lunch, legitimate student discussions involving lab work, or the ever popular, certainly "legitimate," student bull-session - all happening simultaneously.

The important thing, though, and the thing that has proved itself consistently, is that as long as the course objectives are performance-oriented and job-relevant, the instructional system will not fail. The materials, the instructors, and the instructional system can only create an environment conducive to learning; they serve only as "guides" to the ultimate achievement of the objectives. If students reject objectives as meaningless - or if the achievement of relevant objectives is "hamstrung" by arbitrary rules - the student's motivation and identification with the curriculum will be blunted. That the overwhelming majority of student behavior throughout the ORU/Elec Tech Program was purposeful, attests to the relevancy of the objectives, the efficacy of the system used, and the positive attitudes of the instructional staff. (In the two questionable examples of behavior response, it should be noted that their performance was equally poor in their related traditional-concept classes.)

6. *SYSTEMS LEARNING ROOM LOGISTICS*

a. *Individual Study Stations*

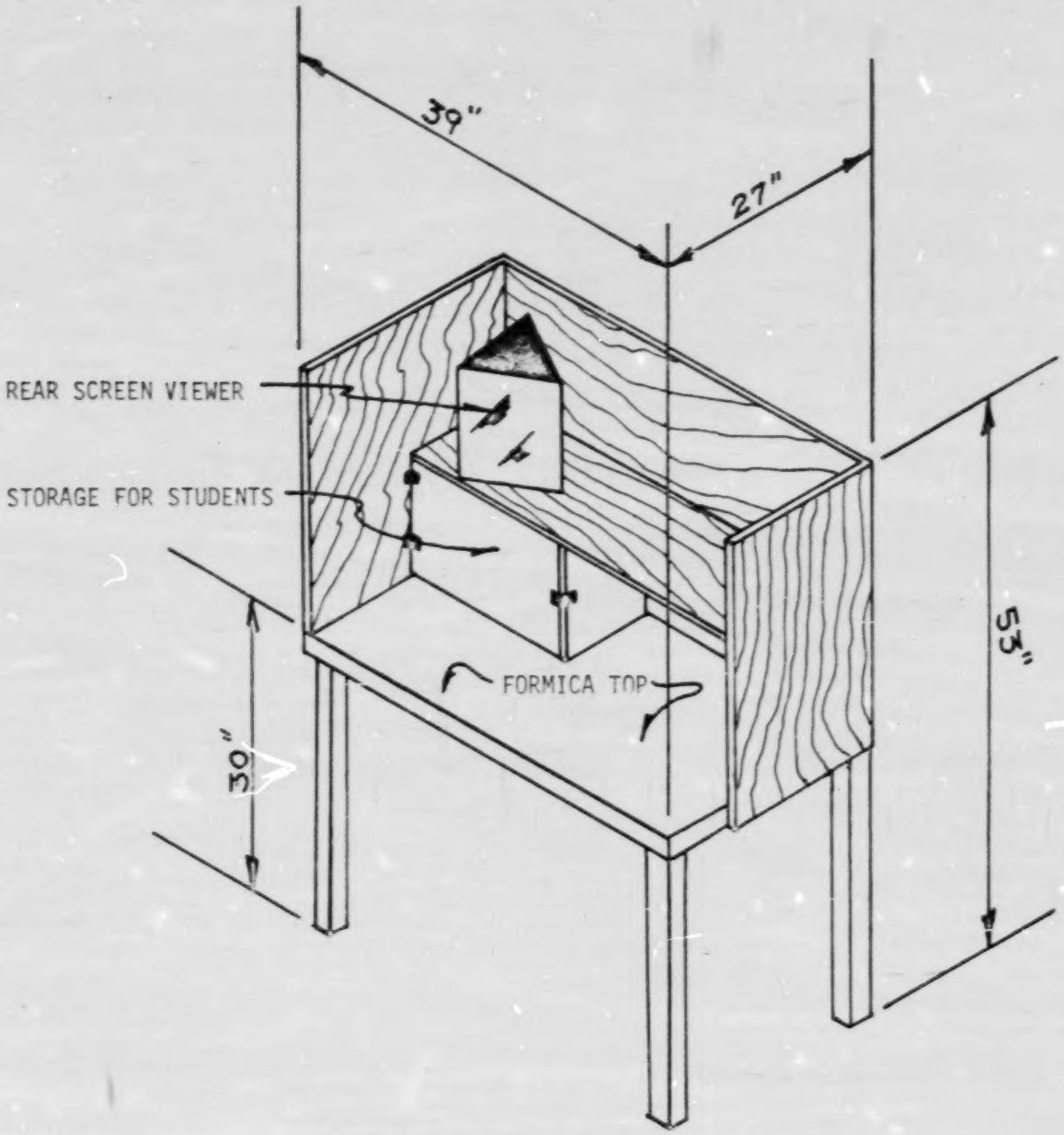
Throughout this report, the individualized study stations located in the systems learning room have been mentioned consistently as a key component in the overall instructional design. It is the feeling of the project staff that the details of developing this room would be of interest.

The individual study stations were designed in carrel fashion, especially constructed to meet the specifications of the Chairman of the Electrical Technology Department. Utilizing a local cabinet maker, and the finishing touches of the Beaufort Tech staff, these stations were made classroom ready for $34 per unit. (See illustration on succeeding page.)

b. *A/V Equipment*

Since the course was designed on a self-tutorial basis, the inclusion of much A/V media was essential. The essential A/V equipment needed for these stations consisted of an auto-focusing carousel projector purchased for $179 per unit, a small cassette tape player/recorder purchased for $28 per unit, and a rear screen viewer constructed by the Electrical Department staff for $2.50 per unit. (Considering that the commercial cost for one of these rear screen viewers was $22 the savings on just this small item became quite significant when multiplied by 17 stations.)

All in all, the total cost per student station, totally equipped, was only $243.50. This compares very favorably with a commercial cost figure (with the same specifications) in excess of $500 per individual station.


39"
27"
REAR SCREEN VIEWER
STORAGE FOR STUDENTS
FORMICA TOP
30"
53"

Extrapolating these figures, the total equipment logistical cost for the ORU/Elec Tech system learning room was approximately $4,I39.50. The comparable retail figure was just below $I0,000.00.

II.D. PROJECT EVALUATION DATA

1. *Student Achievement Evaluation*

The purpose of this evaluation was to determine how well each student achieved the prescribed objectives of the ORU/Elec Tech Program. Student performance on each objective was measured by instructor observation, instructor-student conferences, and by behavior-referenced post-tests. These post-tests totaled 2I for the entire project and were administered at the completion of the unit in which the related objectives were taught.

Table 3 shows the test average results for the units covered to date of this report. Since the program is open entrance, and incorporated the cooperative education component during the third quarter, quite naturally the students are at different levels of unit completion. However, the data recorded for student completion of the first I5 units, comprising Elec I03 and I04, (I05 figures are not complete because of coop) is significant upon examination.

Naturally, significant variations in unit completion times were recorded reflecting the individual rate of study. Within the range of study of the ORU/Elec Tech Project, however, *it can be concluded safely that the time a student takes to complete the courses has little bearing on his achievement in the program.*

As mentioned earlier in this report, an attempt was made to provide a possible capability for predicting completion time ranges for the students through study given to the several test scores on the CGP test

TABLE 3

RELEVANT DATA CONCERNING IN-HOUSE PRODUCED "SYSTEMS" MATERIALS

	Behavioral Obj.	Lab Exercises	Tapes	Slides	Schematics	Add. Software	Post - Tests	Code Resources	EST. completion	AVG. Score*	Revisions	Total No. Units
ELC 103	19	20	10	215	12	12	6	59	77 hr	95.26	3	9
ELC 104	19	17	7	155	10	10	4	30	99 hr	95.19	1	7
ELC 105	25	25	13	190	15	5	6	91	99 hr	n/a**	5	13
ELC 230	10	10	0	0	13	0	5	31	66 hr	n/a**	1	10
TOTALS:	73	72	30	560	50	27	21	211	341 hr		10	39

* Includes the higher of two post-test attempts

** Data insufficient due to Co-op during Spring Qtr. '73

instrument which could relate to learning rates. As it turned out, the scores on the CGP, neither individually nor in combination, correlated significantly with the completion times. Apparently, the learning rate in this project was determined by other unmeasured factors. (From observation, it appears personal motivation and individual learning styles were the prime contributors to completion times.)

2. *PROGRAM OBJECTIVES EVALUATION*

The purpose of this evaluation was to determine how well the pilot ORU/Elec Tech courses had taught the prescribed objectives. Three indicators were used for this evaluation.

a. Instructor observation and feedback

b. The percent of students receiving a threshold score, i.e., 90 percent or higher for the post-tests for the objectives covered on the first attempt, and

c. The percent of students achieving each of the covered-to-date course objectives within two attempts. (If a student required more than two attempts to complete an objective, a careful scrutiny was given to that objective to determine if the difficulty encountered was the result of a faulty objective, or if the student was in fact demonstrating a particular weakness requiring prescriptive remediation.)

RESULTS: First Attempt 71%

Second Attempt 93%

Based on these indicators, it is felt by the project staff that the OUR/Elec Tech pilot program objectives are an unqualified success.

3. *SYSTEM MATERIALS EVALUATION*

The purpose of this evaluation was to identify the problem areas, if any, in the administration of the system materials during the ORU/Elec Tech pilot phase. Both instructor and student observations were taken into account in this evaluation.

At regular intervals student surveys were taken to determine their opinions of the "teachability" of the system materials. As well, a survey was taken at the end of a workshop for high school vocational teachers conducted by Beaufort Tech in July, 1972, concerning these same materials. The results of the germane sections of these surveys may be found in Appendix II.

On a day-to-day basis, a significant events log was kept for each student through the use of daily lab sheets, and a more detailed, periodically required, laboratory log sheet. These were submitted to the instructional staff by the students at the appropriate times, and the data served three functions:

a. The instructor could keep track of the student's daily activities;

b. A record could be kept of the actual time required to complete a lesson (the resulting information used to update the estimated time for completion and identifying problem areas for particular students);

c. An indication could be obtained of the student's attitude toward a unit. After the counseling session following the unit post-test, the instructor would rate his "impressions" of the student's attitude toward the technical content of the lesson and his interest in the presentation technique. The instructors did not solicit the student's opinion of the unit but merely responded to the tone and content of the student's comments during the counseling session. This information proved particularly useful in identifying problem areas in the text chosen for Electric I03, I04 and I05: and, as a result of discussion with the text publisher, more than 2 dozen related changes were made in the new edition of the same text. (Issued April, 1973)

The difficulty areas shown on the lab log sheet in Appendix III were regularly filled in by the students; and, from this instrument, three groups of data were obtained.

(1) Text - The student indicated his personal experience with the textual information. Logic, clarity, and completeness were areas consistently evaluated by the students.

(2) Media - In this area the student would indicate whether the audio/visual equipment and materials at his disposal were available, operating properly, clear, logical or any other information he personally felt directed to this area. This information was an immense help to the Electrical Technology staff in assessing the adequacy of the logistical support materials for the project.

(3) Other - This "catch-all" category was used by the student to indicate any difficulties that he felt personally hindered him in successful completion of unit objectives. During orientation, it was requested that the students be as candid as they wished in filling out these sections. In most cases, as illustrated in Appendix III, they were more than candid.

In any event, when a student completed a unit, the daily form and the unit lab log form were placed in the student's active, up-to-date file. This information is regularly reviewed and validated by the Electrical Technology Staff.

Success is relative; yet, in "systems approach" vehicles for learning, the success of the entire program depends upon the flexibility of the structure to admit valid student feedback on a planned, organized basis.

III. SUMMARY

III.A. GENERAL PROJECT CRITIQUE

All things considered, the results at the end of the first pilot year of operation for the ORU/Elec Tech Project exceeded expectations; most of the instructional materials had had only limited try-out at best; the audio/visual tutorial system had never been before put to the test of full-scale operation at Beaufort Tech; and the management system developed by the project staff existed only on paper and had never been subjected to the vagaries of real people. Yet, both achievement and student motivation were rewardingly high throughout the project pilot period, despite some logistical problems experienced initially.

1. *PROGRAM TEXTUAL MATERIALS*

The only significant student-encountered difficulty occurred because of the outdated edition of the textbook used for Electric I03, I04, and I05. Most of the deficiencies recognized here lay in two areas: Inadequate or outdated information, and an inconsistency of relationship with the latest edition of the National Electrical Code (which has a more recent publication date). As stated previously, this problem has resolved itself through the issuance of the current edition of the basic text; and thereby it will continue to be used as a contributing component to the overall system. In order to compensate for continuous code revisions (the NEC is revised, updated, and reissued every two years), continuing project revision efforts will be more selective in scope and will emphasize specific supplements designed to keep the course continually updated.

In another area, careful monitoring of problems encountered by the first students through a specific unit was of value, in that it resulted in the correction of typographical errors, the production of additional

practice problems, and the development of more supplemental audio/visual materials before the remainder, or new-entering students started that unit. These on-the-spot corrections comprised roughly 75 percent of all the corrections to printed material. The remaining corrections were derived from an analysis of the post-tests and other feedback devices such as the laboratory log sheets.

2. *AUDIO/VISUAL MATERIALS - EQUIPMENT*

The unavailability of AV equipment caused the greatest difficulty in the beginning administration of the project. The project staff had ordered the necessary equipment two months prior to the calendar starting date for the course but did not receive delivery of the equipment until three weeks and two days past the initial target date. Other than this unfortunate delay, no other difficulties were encountered with the AV equipment.

It should be noted here that as a result of properly orienting the students in equipment utilization, not one projector lamp had to be replaced over the course of the entire pilot program. (For those interested in the "nitty-gritty" costs of an AV tutorial system, that's a statistic you can "sink your teeth in.")

a. *Film*

The majority of the slides produced for the project were shot with Kodak Ektachrome 35 mm film. For indoor usage, Ektachrome, tungsten based film, will reproduce with excellent color representation without the use of flash attachments. For outdoor photography, this film produces less than desirable (washed-out) tones, and for these occasions the project staff recommends a non-tungsten based film.

For developing purposes, it is recommended that much study be

given to the least expensive sources available. The duplication of slides, in numbers sufficient for constant student availability, is a major cost factor in developing this type of learning system. Normal retail costs, without discount, for reproducing already developed slides, is 30 cents per slide. After much comparative shopping, the project staff at Beaufort Tech was able to find a firm that would do bulk reproduction for I7 cents per copy.

b. *Tape Cassettes*

The tape cassettes chosen for use in this project were State contract listed TDK C-60 types. These units have 30 minutes per side recording times, which is more than sufficient for audio narration for one unit or a number of units. It is further suggested that no one audio lesson exceed 25 minutes. Experience gained from this project indicates that a student's "operant span" does not generally exceed this figure.

Again, these tapes were the least expensive available under contracted sources and yet have proved quite adequate for teaching purposes. Although limited in fidelity reproduction, they are good enough to be practicable and, best of all, have evidenced durability.

3. *LABORATORY MATERIALS*

As has been implied throughout this report, the units primarily associated with laboratory hardware exercises were most sucessful both in achievement and in the affective domain. But, a problem was encountered when, initially, more students entered the program than had been anticipated. Momentarily, this created a slight materials and equipment shortage. Although I5 individual stations were available, 26 students began the course simultaneously, and complete sets of equipment and materials were

not available to everyone. With the addition of supplementary supplies, and the resulting "pacing out" of the students, the situation was alleviated.

On the other side of the coin, certain items in constant demand would, on occasion, "wander off." This situation has since been resolved through assigning each student a complete set of needed materials and holding each one responsible for his own supplies. Storage lockers have been provided for the students, and any missing supplies must be replaced at the student's expense. This has proved to be a workable solution.

4. *TESTS*

With few exceptions, the post-tests, as originally developed, were easy to administer and evaluate. Through counseling sessions with the students following the completion of a test, it was determined that incorrect responses in almost every instance were due either to a lack of knowledge, or an impetuous action (oversight, sitting for the test before prepared, etc.). Perhaps due to the frequency of testing (no more than two units before testing), or due to the confidence of the students in their own ability, they exhibited almost no test anxiety.

Interestingly enough, the post-tests did not dominate the course in the student's eyes; they seemed to view these tests as merely measures of their personal progress - feeling satisfied when they were right and acknowledging the need to correct their deficiencies when they were not right. This unusual but pleasant test atmosphere is attributed in part to the nature of the system:

a. There were few surprises; the students were aware of the performance expected of them and the level for their performance, through the precisely stated behavioral

objectives determining each course requirement.

b. Their evaluation was criterion referenced rather than based on a normative scale; the students were not competing against each other (except for a few healthy, friendly rivalries), but against a standard.

On the other end of the spectrum, pretesting opportunities were available but used only occasionally. Most students did not feel that they had the necessary background and preferred to enter the course at the beginning level. (Several students did enroll in the course with backgrounds of relevant experience and through pretesting began their study at a higher level in the course than the beginning units. In all instances, those students that were encouraged to use the pretest vehicle proved capable and began instruction in the program precisely where their knowledge base required.)

5. *INSTRUCTIONAL STAFF*

No review of the pilot ORU/Elec Tech Project would be complete without commendation to the Electrical Technology staff members. A special salute is deserved by the Electrical Technology Department Chairman, Harold S. Bowers, for his quick adaptation to the initial management system and his significant contributions to the evolution of the system's components and policies. His commitment to the success of the program was demonstrated each day by the extra time, voluntarily contributed, (including at one point nights and weekends for a period of five months), in developing system resources. Through his leadership the staff has developed into a highly effective team of "instructional managers."

Conversely, there is another side which should be reported here for the benefit of others. Initially, there were some instances during the pilot phase when students could not have constant access to instructors for interaction. In most cases, this was caused by the extra demands placed on the instructors-due to the large student load beginning the course simultaneously, and other responsibilities such as: recording errors, collecting data, making revisions to materials, etc. In the

remaining cases, it was probably due to the newness of the technique and, therefore, the unavoidable lack of comfortability with managing this type of instructional system. At this point, with the pilot phase completed, the expertise of management is clearly evidenced and this problem has been ameliorated.

6. *MANAGEMENT SYSTEM*

The management system, which (1) guides the students through the various media and resources, (2) enables the instructional staff to monitor, evaluate, and generally interact with any number of students doing any number of different tasks, and (3) collects validation data, seems to work very well. With a minimum of documentation, and a minimum of hard-and-fast rules and regulations, all persons seem to know exactly what is expected of them and they conform easily to the spirit of the system.

At the start of the project, the students were told that the course was individualized and that this meant they would be allowed to work at their own pace. Initially, no controls or incentives were established to determine the pace of the instruction; and, in retrospect, this may have been a mistake. In the beginning, the Electrical Tech staff instructors spent an inordinate majority of their interaction time with a few students who appeared to have difficulty independently searching out and utilizing information. These individuals were consistently slower in performance; however, their slowness did not mean their quality of work was poor. Simply put, they consistently asked for help doing things that others (1) did by themselves, or (2) correctly identified as being of low priority, not warranting interaction with the instructor.

Consequently, in the fifth month of the pilot phase, a decision was made by the Chairman of the Electrical Department to allow those students who had reached a specified level of competence to participate in all 11-week cooperative education work experience. Not surprisingly, this created an incentive awareness among many students who were close to the exit plateau: and, in most instances, these students literally doubled their efforts to reach the point of qualifying for the co-op experience. As a result, this somewhat late-discovered incentive has now been factored into the system as a regular component.

Significantly, a follow-up on the student reaction to the availability of the co-op benefit revealed that almost all students agreed that some time goals or milestones were desirable (even if, individually, they were not required). Hence, as of this report, enough data has been gathered to provide the Electrical Technology staff with some "guidelines" for estimating probable unit completion times, which will aid student counseling and evaluation.

III.B. CONCLUSION

In general, the project results were excellent. Student acceptance was complete, with the exception of a few problems of adjustment to unfamiliar techniques. The challenging nature of the course, and the surprise of some students (who admitted that they thought at the beginning they might not be able to succeed), was noted.

In conclusion, the project staff feels that no matter how the learning vehicle is designed, no matter what technique and resources are applied, learning, for most people, is still hard work. Fortunately, students will work hard (at even difficult tasks) when they recognize them as

relevant to their career goals; and, students will respond positively to the challenge of difficult materials when they are presented in a free learning environment where individual responsibility is rewarded.

In a nutshell, students who work before and after scheduled class periods-students who spend their days off from their jobs studying for 8 hours in a lab-and instructors who spend many extra hours after a normal working day discussing individual problems, correcting materials, and assisting in the overall development of a learning system, truly indicate the success and merit of individualized systems for learning.

APPENDICES

APPENDIX I

Electrical Technology

UNIT 9

UNIT 9

LIGHTING BRANCH CIRCUIT - HALL AND FRONT ENTRANCE

I. UNIT OBJECTIVE (S): The instruction in this unit is designed to enable the first year Electrical Technology student to:

.State installation procedures for outdoor lighting, demonstrate proper 3-wire circuit connections, demonstrate how lighting fixtures can be controlled from more than one point, and form the total lighting circuit A29.

II. KEY TECHNICAL INFORMATION IN UNIT 9:

1. Outdoor Lighting

The Outdoor Lighting in this unit consists of:

1. Post lights
2. Shrub lights

Read National Electrical Code: 339 - 1; 339 - 3, Sections A, B, and C.

2. Grounding

Read National Electrical Code: 250 - 42

3. Switch Locations and Arrangements

See cable layout in text (p. 77), and blueprint *8/9* (Hall Section)

4. Correct Method of wiring a 3-way circuit

A neutral conductor in a 3 wire circuit carries *only* the *unbalanced* load if properly connected.

For example, on a 3 wire circuit the A phase carries 10 Amps, and the B phase carries 12 Amps, then the neutral only carries 2 Amps. If *not* properly connected, the neutral would carry the *entire* load, or 22 Amps.

III. RESOURCE ASSIGNMENT (S):

(Continued on next page)

1. Review Unit 9 tape/slide overview; stop when instructed.

CONT - RESOURCE ASSIGNMENT (S):

2. Study Unit 9 in text

3. Begin lab assignment(s) as directed.

4. Upon completing all lab assignments for Unit 9, proceed to Unit 10.

LABORATORY ASSIGNMENT: 9

A. STUDENT PERFORMANCE OBJECTIVE (S):

1. *Given a device wiring diagram, the first year Electrical Technology student will draw the proper schematic connections between devices, in accordance with the unit cable layout, and the rack schematic for unit 9.*

    1. Review tape/slide presentation as needed for understanding.
    2. Use diagram in your text (page 87)
    3. Use colored pencils to trace circuit
    4. Have instructor check diagram

    DO NOT GO TO OBJECTIVE #2, UNTIL TOLD TO DO SO

2. *Given the necessary tools and equipment, the first year Electrical Technology student will properly install a three-wire lighting circuit for a front hall and outside yard lights in accordance with the rack schematic in this unit and the standards of the National Electrical Code.*

    1. Review tape/slide presentation: Lab 9 (rack work)
    2. Study lab schematic in your guide
    3. Check out appropriate tools and equipment
    4. Install circuit on rack: Follow procedure list
    5. HAVE INSTRUCTOR CHECK RACK WORK
    6. Fill out lab log sheet for Unit 9

B. TOOLS AND EQUIPMENT:

1. Basic Tool Kit
2. 9 Switch Boxes
3. 1 - 4" Square Box
4. 7 Bar Outlet Boxes
5. 2 S_3 Switches
6. 1 S_4 Switch
7. 1 S_1 Switch
8. 3 Switch Pilots

CONT - TOOLS AND EQUIPMENT

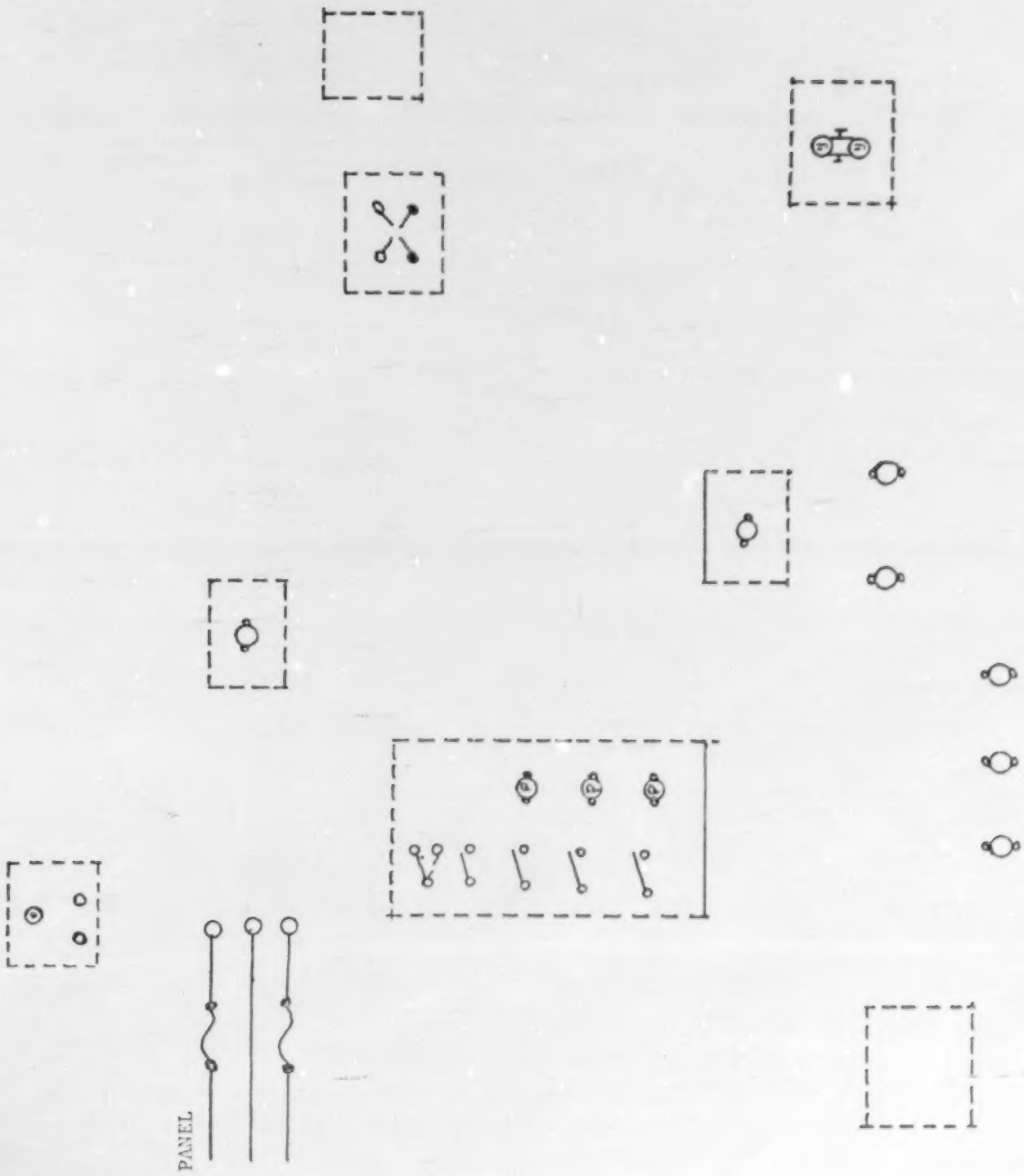
9. 4 Romex Connectors
10. 7 Keyless Lamp Holders
11. Ground Clips
12. Wire Nuts

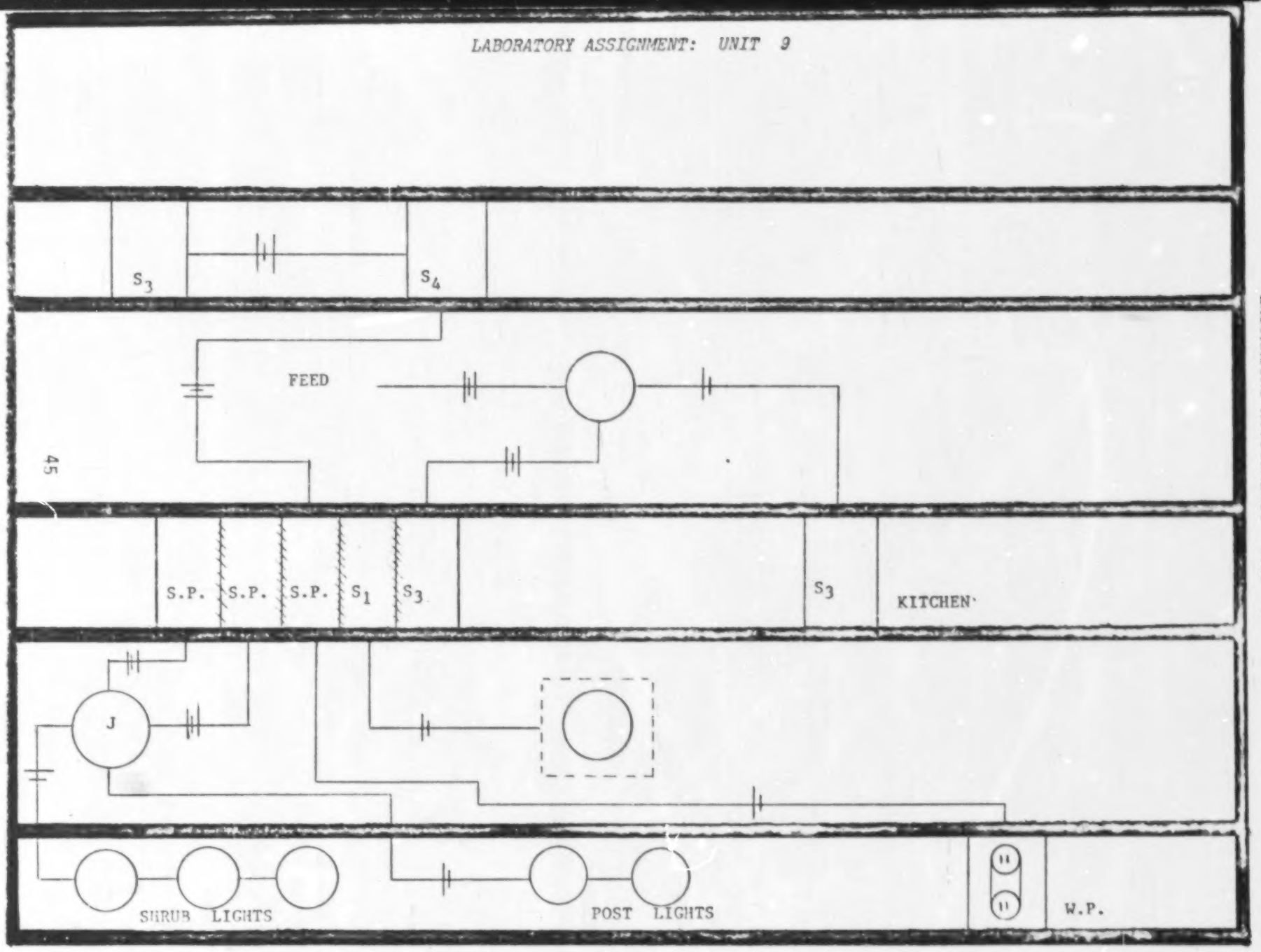
C. INSTALLATION PROCEDURES:

Slide 1	1.	Mount boxes securely to rack according to box layout
Slide 2	2.	Run cable according to cable layout
Slide 3	3.	Make bond in grounding wires and install grounding clips
Slide 4A	4.	Bond all 6 grounding wires in 5 gang box together to form 1 single bonded joint and install grounding clip
Slide 4B	5.	Ground all remaining devices
Slide 5A	6.	Make joints in neutrals in 5 gang box: install a "pigtail" of sufficient length to connect "tie together" 3 pilot lights. Then make joints in hot conductors and install a pigtail of sufficient length to connect 4 devices
Slide 5B	7.	Make hooks in device leads in 5 gang box in order to connect the devices discussed in step 6
Slide 5C	8.	Note spare 3 conductor cable from 5 gang box to junction box in basement
Slide 6	9.	Make all necessary remaining joints
Slide 7A	10.	Connect hot conductor to brass terminal on "line" side of SP
Slide 7B	11.	Connect neutral conductor to nickel terminal on pilot light of the SP
Slide 7C	12.	Connect switch leg to brass terminal on "load" side of switch
Slide 8	13.	Connect all remaining devices
Slide 9	14.	Install all devices in their boxes and add coverplates

UNIT 9

DEVICE WIRING DIAGRAM





LABORATORY ASSIGNMENT: UNIT 9

LAB LOG SHEET

NAME: _____

DATE: _____

POST-TEST SCORE (S): _____ / _____

UNIT

9

TIME STARTED: _____

TIME FINISHED: _____

DIFFICULTY AREAS:

TEXT:

TAPE/SLIDES:

RACK WORK:

OTHER:

INSTRUCTOR/RECORDER: _____

DO NOT PROCEED UNTIL INSTRUCTED TO DO SO

APPENDIX II.A.

SURVEY (SAMPLE)

Systems Approach

Electrical Technology

Check One ONLY:

1. I like having the responsibility for my learning.

   ALWAYS 76% SOMETIME 24% NEVER____

2. I like this new system of learning more than listening to an instructor lecture.

   ALWAYS 68% SOMETIME 32% NEVER____

3. I find it helpful to have the statement of the reasons for learning (Rationale).

   ALWAYS 64% SOMETIME 36% NEVER____

4. I find it helpful to have the statement of what I am expected to do (Performance Objective).

   ALWYAS 76% SOMETIME 24% NEVER____

5. I am able to read and understand the instructions given to me.

   ALWAYS 48% SOMETIME 48% NEVER____

6. I learn more from the reading material than the sound-slide program.

   ALWAYS 4% SOMETIME 56% NEVER 40%

7. I enjoy being able to learn at my own speed.

   ALWAYS 76% SOMETIME 24% NEVER____

8. Upon completion of a test, I feel confident that I have achieved the Objective.

   ALWAYS 72% SOMETIME 28% NEVER____

9. Considering all things about this new instructional system, I think it is a more effective method of learning.

   ALWAYS 80% SOMETIME 20% NEVER____

APPENDIX II.B

(Selected comments from a High School Instructor Workshop conducted at Beaufort Tech relating to the Elec. Tech. "systems" approach.)

1. "This Institute has given me many new ideas for approaches to the courses I teach and I will try many of these during the coming year."

2. "This information can be used to develop a workable yearly plan. Much was learned on methods for presenting lessons on individual basic stations."

3. "From Information handed out, I think I can much better set up my classroom."

4. "The methods of presenting information will be of great value in teaching all phases of my program."

5. "This workshop will help me a great deal because I learned a lot about using films and slide projectors in teaching."

6. "My administrative unit calls for a construction cluster program, and the information, printed materials, and knowledge gained in this institute will certainly make the task more easier."

7. "The information received here will be available to me many times through the next year and years to come because of the theory, materials and helpful instruction received. These workshops should be continued in order for teachers to be up to date in their teaching."

8. "Lab applications and methods of presenting information, excellent."

9. "Different approach to subject; good new ideas."

10. "I thoroughly enjoyed the hands-on approach with guidance from the A-V materials developed by Bowers and Simmons."

LAB LOG SHEET

NAME: Joe Price

DATE: 11-6-92

POST-TEST SCORE (S): 12A 1

UNIT

5 A

TIME STARTED: 1:30

TIME FINISHED: 1:40

DIFFICULTY AREAS:

TEXT: Confusing

TAPE/SLIDES: the only real help should have

RACK WORK: [illegible] should've a lot of questions

OTHER:

INSTRUCTOR/RECORDER: J.S.P.

DO NOT PROCEED UNTIL INSTRUCTED TO DO SO

6

LAB LOG SHEET

NAME: Joe Price

DATE: Sept. 29, 1992

POST-TEST SCORE (S): 1

UNIT

2 B

TIME STARTED: 2:05

TIME FINISHED: 2:20

DIFFICULTY AREAS:

TEXT: I learned so much by reading Cooper comics.

TAPE/SLIDES: good but slow

RACK WORK: Rack wouldn't hold box

OTHER:

INSTRUCTOR/RECORDER: J.S. Price

DO NOT PROCEED UNTIL INSTRUCTED TO DO SO

16

BEST COPY AVAILABLE

INSTRUCTOR "TRACKING" SHEET

STUDENT: _____ DATE ENTERED: _____

	2nd QTR.																3rd QTR.										
UNIT	1	2	2A	2B	2C	3	4	4A	5	5B	5C	5D	5E	5F	5G	6	7	8	9	10A	10B	11	12	13	14A	14B	14C	15	16
COMPLETED																													
POST-TEST																													
DATE COMPLETED																													
REQ. DATE																													
TEST AVERAGE																													

	3rd QTR.													
UNIT	17	18	19	20	21	22	23	24	25	26	27	28A	28B	
COMPLETED														
POST-TEST														
DATE COMPLETED														
REQ. DATE														
TEST AVERAGE														

M E M O R A N D U M:

TO: Mr. Blanton, President

FROM: Donald C. Chesnut, Director of Student Affairs

SUBJECT: Comparison of FTE Generated by the Electrical Curriculum for the School Years 1971-72 and 1972-73

DATE: July 18, 1973

The attached report is a comparison of FTE generated by an open lab curricula vs. a traditionally taught curricula.

Only those courses directly connected with the technical content of the curricula were used for comparison purposes. This comparison was further restricted by using only one hundred level courses.

The first two quarters of the open lab concept generated more FTE than were generated by the traditional curricula. This is directly related to an increase in student enrollment and to the fact that more technical courses were offered during the school year 1972-73.

The spring quarter of the open lab instructional model shows a decrease in creditable FTE for the one hundred level courses. This is accounted for by the fact that thirteen (13) students were enrolled in a Cooperative Experience Coe-201, for spring quarter. Coe-201 generated a total of 9.34 FTE. If this total had been included in the comparison, the spring quarter of 1973 would have also shown a slight increase over the FTE for the spring quarter of 1972.

A cumulative total of FTE generated by the technical courses in the Electrical curriculum of the school year 1971-72 is 37.84; for the school year 1972-73 it is 66.15. If the FTE for those first year students who were enrolled in Co-op program, are added to the total FTE for 1972-73 that total would be 75.49 FTE.

cc: George Van Allen, Assistant Director of Faculty
Harold Powers, Department Chairman